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PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Protection of Polyvinyl Chloride.

We, UNITED STATES RUBBER COMPANY, of Rockefeller Centre, 1230 Avenue of the Americas, New York 20, State of New York, United States of America, a corporation organized and existing under the laws of the State of New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to protecting polyvinyl chloride containing certain plasticizers against mildew growth, and against stiffening due to plasticizer depletion caused by bacteria and fungi.

Polyvinyl chloride is commonly compounded with 50 to 100 parts of plasticizer per 100 parts of the polyvinyl chloride, and in the case of certain plasticizers, the polyvinyl chloride is quite susceptible to discoloration due to microbial growth and subsequent stiffening when buried in soil.

We have found that N-(3-chlorophenyl)itaconimide is an effective protectant against mildew growth of polyvinyl chloride containing 50 to 100 percent based on the weight of the polyvinyl chloride of plasticizers such as (a) dialkyl phthalates in which the alkyl radicals have 3 to 12 carbon atoms, e.g. dibutyl phthalate, dioctyl phthalate and didodecyl phthalate, (b) di-acid esters of a glycol such as diethylene glycol or dipropylene glycol or triethylene glycol, and a monocarboxylic acid, such as benzoic acid, or an alkanolic acid having 2 to 10 carbon atoms, e.g. diethylene glycol dipelargonate, dipropylene glycol dibenzoate, triethylene glycol diacetate, and triethylene glycol di-(2-ethyl hexoate), and (c) epoxidized soybean oil. The amount of N-3-(chlorophenyl)ita-

conimide used will be from about .05% to 5% based on the weight of the polyvinyl chloride

The following examples illustrate the invention. All parts and percentages referred to herein are by weight.

Example 1

The following six polyvinyl chloride (PVC) film recipes I to VI were mixed on a two-roll mill at 280°F. for 5—10 minutes.

- | | | |
|-----|---|----|
| I | 100 parts of PVC and 70 parts of dioctyl phthalate. | |
| II | 100 parts of PVC, 70 parts of dioctyl phthalate and 0.7 part of N-(3-chlorophenyl)itaconimide. | 55 |
| III | 100 parts of PVC, 60 parts of dioctyl phthalate and 10 parts of epoxidized soybean oil. | |
| IV | 100 parts of PVC, 60 parts of dioctyl phthalate and 10 parts of epoxidized soybean oil and 0.7 part of N-(3-chlorophenyl)itaconimide. | 60 |
| V | 100 parts of PVC and 70 parts of dipropylene glycol dibenzoate. | 65 |
| VI | 100 parts of PVC, 70 parts of dipropylene glycol dibenzoate and 0.7 part of N-(3-chlorophenyl)itaconimide. | |

Films of 10 mil (0.010 inch) thickness were then calendered. Five strips of each film (1" × 6") were buried in moist soil highly infested with microorganisms and kept at 86°F. and 100% relative humidity for periods of 2, 4, 6 and 8 weeks. Samples were removed from the soil after each interval and inspected for mildew growth. The mildew growth ratings are shown in the following table:

[Price

Mildew Growth Ratings of Compounds

Weeks Burial	I	II	III	IV	V	VI
0	clear	clear	clear	clear	clear	clear
5	2	slight black spotting	none	slight orange spotting	clear	clear
10	4	same	none	heavy orange spotting	slight pinkish	moderate orange spotting
15	6	moderate black	none	same	same	clear
20	8	heavy black spotting	none	same	moderate black spotting	heavy orange spotting

In each case, the inhibition of fungal discoloration is demonstrated with N-3-chlorophenylitaconimide.

Example 2

20 This example again illustrates the effectiveness of N-(3-chlorophenyl)itaconimide as a protective agent for the plasticizers in polyvinyl chloride.

25 The polyvinyl chloride films I to VI compounded as in Example 1 were cut into 1 square inch specimens. Duplicate squares were placed under aseptic conditions in

100 × 15 mm Petri plates containing potato dextrose agar as a growth medium. After preparing a spore suspension of the fungus *Aspergillus niger* van Tieghem using 100 ml. sterile distilled water per one week old slant the Petri plate were inoculated at 30 C. for periods of one and two weeks. At that time, the polyvinyl chloride specimens in the Petri plates were examined under the microscope for fungus growth. The results were recorded and expressed as none, trace, slight, moderate, and severe mildew growth on the PVC film as follows:

Mildew Growth Ratings of Compounds

Incubation	I	II	III	IV	V	VI
1 week	trace	none	slight	trace	slight	none
2 weeks	slight	trace	severe	trace	moderate	none

45 This example again illustrates the effectiveness of the chemical of the present invention in protecting the plasticizers from mildew growth.

WHAT WE CLAIM IS:—

50 1. A polyvinyl chloride composition containing from 0.05 to 5 per cent of N-(3-chlorophenyl)itaconimide based on the weight of the polyvinyl chloride.

55 2. A composition as claimed in Claim 1 which further comprises from 50 to 100 parts by weight per 100 parts of the polyvinyl chloride of a plasticizer.

3. A composition as claimed in Claim 2

wherein the plasticizer is a dialkyl phthalate in which the alkyl radicals have from 3 to 12 carbon atoms, a di-acid ester of a glycol and benzoic acid or an alkanolic acid having from 2 to 10 carbon atoms or epoxidized soya bean oil.

4. A composition as claimed in Claim 3 wherein the di-acid ester is derived from diethylene glycol, dipropylene glycol or triethylene glycol.

5. A composition as claimed in Claim 1 substantially as described in any one of the foregoing Examples.

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